

Lake Michigan and Coastal Area Campaign

The actions included within this campaign are provided to help guide the next 10 years of implementation. While other actions may be needed and larger goals could be set, the campaign prioritizes the actions contained in this section as realistic, achievable and most needed to best aid in meeting the overarching goals of the Illinois Wildlife Action Plan (IWAP) to:

1. Establish desired number and distribution of viable populations for each Species in Greatest Conservation Need (SGCN)
2. Manage habitats through promoting natural processes, desired structure, and disturbance regimes for the benefit of native species, and
3. Develop resiliency and connectedness into habitats so species can adjust to landscape and environmental changes.

CAMPAIGN DESCRIPTION

Lake Michigan is a deep-water, oligotrophic ecosystem comprised of nearshore and open water benthic and pelagic zones that support a diverse mix of native and non-native species. Illinois shares Lake Michigan ownership with 3 other states: Wisconsin, Indiana, and Michigan. Management authority is shared by the states and a number of tribes represented by the Chippewa-Ottawa Resource Authority. Approximately 1,526 square miles of Lake Michigan are within the Illinois state boundary, but management and stewardship of the lake's resources requires coordination among all the Lake Michigan management jurisdictions.

The land-based coastal ecosystem in Illinois includes three subunits of the Northeastern Morainal Natural Division that contain oak savannah remnants, woodlands, coastal bluffs and ravines, prairies, wetlands, urbanized waterways, beaches, dune/swale habitats and pannes. This varied landscape is important to numerous aquatic and terrestrial resident and migratory fauna, including imperiled taxa categorized as Species in Greatest Conservation Need (SGCN).

Illinois coastal habitats are especially significant because of their proximity to this large Great Lake, which exerts influences and effects not found in other parts of the state. Wave energy and changeable water levels directly affect the interface of land and water, while wind dynamics, strong storm events, and lake temperature exert their influence farther inland, causing more regional effects. In addition, the presence of the lake significantly affects the migration of birds, bats, and flying insects, funneling them into a coastal corridor through northeastern Illinois. Finally, the urban metropolis of Chicago creates its own set of influences and challenges to the variety of species and habitats in the region. As such, these coastal habitats, terrestrial and aquatic, are unique and face challenges often different than those encountered in other parts of the state.

The purpose of the Lake Michigan and Coastal Area Campaign is to maintain and enhance biodiversity in the lake and coastal area largely through habitat protection and improvement. Rehabilitation of rare or extirpated plant and animal populations is also considered, when appropriate. The campaign focuses on the area within boundaries defined for the Illinois Coastal Management Program (ICMP). This area encompasses the lake offshore to the Illinois State line and inland to the boundary of the hydrologically-modified Lake Michigan basin and the Chicago and Calumet Rivers (See Appendix I for map).

The area within the campaign boundary is located entirely within the Chicago Metropolitan Area. This landscape has been substantially altered by human activities (e.g., invasive species, housing and urban development, shoreline hardening and modifications, and landfills, among others). Campaign goals and actions included within this document reflect this reality and are intended to be realistic, achievable and could be implemented during the 10 years covered by this update of the IWAP (2015-2025).

GUIDING PRINCIPLES AND GOALS

Guiding Principles

- There is significant overlap of needs among the various IWAP campaigns, so this campaign will focus on area-specific needs and priorities, understanding that some goals and actions identified in other campaigns are also very relevant in the Lake Michigan Coastal Campaign.
- A diversity of functional habitats (i.e., dynamic systems of hydrologically and biologically connected areas that support requirements of desired species for sustained production) will be needed to maintain and enhance SGCN in Lake Michigan and its coastal areas.
- Utilize an adaptive, hypothesis-driven approach to habitat protection and improvement that includes monitoring results as a feedback mechanism to guide future actions.
- Recognize that successful outcomes from habitat protection and improvement actions will require cooperation among stakeholders.
- Understand that cumulative actions may be necessary before desired benefits for SGCN are realized.
- Protecting critical habitat (e.g., through the designation of priority management areas) to benefit SGCN has a higher priority than habitat enhancement, which in turn, has a higher priority than restoring habitat to pre-settlement conditions.
- Rehabilitation of imperiled fish populations in Lake Michigan requires coordination with the Lake Michigan Committee of the Great Lakes Fishery Commission, as agreed to by Great Lakes state, federal, tribal and provincial resource agencies party to *A Joint*

Strategic Plan for Management of Great Lakes Fisheries (Joint Plan). The Illinois Department of Natural Resources (IDNR) is a signatory to the *Joint Plan*.

Goals

- Minimize and mitigate adverse effects of new and existing coastal development on SGCN and the habitats necessary to sustain populations.
- Increase public education/outreach and the use of best management practices to prevent new introductions of aquatic and terrestrial invasive species, limit expansion of existing populations and reduce impacts of invasive species on native populations and habitats.
- Increase abundance and richness of SGCN and other native taxa in Lake Michigan and its coastal habitats.
- Increase the abundance and quality of functional habitats that support healthy populations of Lake Michigan's fish and wildlife.
- Maintain and increase, if possible, the quality and extent of rare coastal natural communities and complexes of these communities that support SGCN.
- Maintain and/or reestablish hydrologic and biological/ecological connectivity between Lake Michigan and associated coastal wetlands and tributary streams while considering potential adverse and beneficial effects of connectivity on native populations and habitats.
- Develop public support for Lake Michigan wildlife and fish conservation by supporting outreach activities and recreational access to Lake Michigan and coastal natural areas.
- Increase funding availability and consistency for habitat work in Lake Michigan and the coastal area.

STATUS AS OF 2015

In the original IWAP, Lake Michigan and its Coastal region was not specifically addressed in its entirety. This new campaign was developed to address this gap in the IWAP 2015 update and to reflect the ongoing and needed work to protect the Great Lakes and coastal specific species and habitats. Because this was not an existing campaign, we cannot report on campaign progress and activities over the past 10 years. Instead, this section highlights noteworthy initiatives, activities, and threats relevant to species and habitat conservation and provides some history and status information on key IWAP targets.

Status of Lake Michigan Species and Management

Lake Michigan Fisheries

The present day Lake Michigan fish community includes a diversity of native and nonnative species that comprise a highly managed and unstable fishery. Historically, Lake Trout and

Burbot were the top predators preying on Lake Whitefish, Ciscoes, Chubs, Sculpins and Yellow Perch. Due to a complicated array of factors including environmental degradation, over-harvest and predation by invasive Sea Lamprey, the historic fish community collapsed by 1950. Lake Trout populations were the most impacted. The resulting decline of predator populations allowed the non-native Alewives and Rainbow Smelt, and native Bloaters to reach historic levels of abundance. Control of Sea Lamprey populations by the Great Lakes Fishery Commission allowed for rehabilitation efforts to begin for Lake Trout and stocking of other non-native salmon and trout. The present fishery consists of five salmonine predators, which are largely maintained by stocking, Yellow Perch, and several nearshore species found primarily in harbors and near breakwalls (e.g., Northern Pike, Largemouth Bass, Smallmouth Bass, Rockbass, Bluegill and Freshwater Drum).

Lake Michigan fish SGCN have received limited attention in the past, except for recent and ongoing work by researchers at the Shedd Aquarium. The emphasis has been on filling data gaps from other surveys, looking for threatened and endangered species to aid the listing process of the Illinois Endangered Species Protection Board, and collecting species-habitat utilization data that can be incorporated into habitat restoration projects.

Effective management of the Lake Michigan fishery requires the IDNR to manage its fishery as a component of a whole-lake management strategy described in *Fish Community Objectives for Lake Michigan*. Environmental and habitat issues impeding achievement of fish community objectives have been identified in *Lake Michigan Environmental Objectives*, which includes a strategy to guide habitat improvement. A draft document of environmental principle for sustainable fisheries in the Great Lakes has been developed by the Great Lakes Fishery Commission Council of Lake Committees. These principles informed the guiding principles included earlier in this Campaign narrative.

Invasive species are a significant threat to Lake Michigan fisheries and aquatic habitat covered by this campaign. There is a separate, stand alone Invasive Species Campaign that addresses these threats, impacts, and needed actions on a statewide level. However, the following paragraph highlights invasive species that are specific to, or a high priority threat to Lake Michigan.

Numerous Aquatic Invasive Species (AIS) were brought to the U.S. in ballast water from ocean going vessels or gained access to the Great Lakes through man-made shipping canals or waterways. Species, such as the Spiny Water Flea, Zebra and Quagga Mussels, Sea Lamprey and Round Goby have flourished in Lake Michigan and continue to have substantial adverse effects on lake ecology and native taxa. Mandatory ballast water management regulations were implemented in 2008. These regulations appear to have stopped the influx of AIS via the ballast water vector, as no new aquatic invasive species from outside North America have been

identified in the Great Lakes during the past 7 years. Prior to the regulation changes, it has been reported that a new, non-native species was identified in the Great Lakes on average every 9 months.

Lake Michigan Management and Monitoring

A broad range of environmental issues in the Illinois waters are addressed through the *Lake Michigan Lakewide Management and Action Plan* (LAMP). Lakewide biodiversity has been addressed in the *Lake Michigan Biodiversity Conservation Strategy* developed by The Nature Conservancy for the LAMP Technical Coordinating Committee. Additional environmental management plans, including a Nearshore Framework and Lake Ecosystem Objectives are being developed to meet requirements of the 2012 Great Lakes Water Quality Agreement.

A number of federal agencies participate in lake-wide monitoring programs that have sampling stations in the Illinois portion of Lake Michigan. The United States Geological Survey (USGS) Great Lakes Science Center has conducted annual surveys of Lake Michigan prey fish populations with bottom trawls since 1973 and hydroacoustics since 1992. Both sampling methods have documented declining prey fish abundance and biomass in recent years. For all preyfish species combined, lakewide bottom trawl biomass estimates reached a record low of 5.1 kilotonnes in 2014.

Nearshore and offshore fish populations are assessed annually by the IDNR Lake Michigan Program through five assessment surveys that track relative abundance of fish predators and prey (spring index gill netting), Yellow Perch population trends (Yellow Perch gill netting and beach seining), nearshore sport fish populations (summer harbors boat electrofishing), stocked salmon and trout returns (fall harbor electrofishing) and Lake Trout rehabilitation efforts (spring lakewide and fall spawning gill net surveys). These assessments are supplemented by research conducted by the Illinois Natural History Survey's (INHS; Prairie Research Institute, University of Illinois) Lake Michigan Biological Station located in Zion. Long term monitoring data show substantial declines in abundance of Yellow Perch, Alewife, Bloater and Rainbow Smelt. Abundances of many of these species are at or near record lows in the time series. While specific causes of declining populations are not clear, they appear to correspond to population expansion of invasive species (e.g., Zebra Mussels and Round Gobies during the 1990's and Quagga Mussels during the 2000's). Of positive note is the stable Lake Trout population in Lake Michigan's southern basin and relatively high rate of unmarked "wild" trout from Illinois offshore reefs (about 50 percent in recent fall assessments).

The National Oceanic and Atmospheric Administration (NOAA) Great Lakes Environmental Research Laboratory has conducted lake-wide benthic surveys at 5-year intervals (1995 – 2010) to track changes in abundances of the amphipod *Diporeia* spp. and abundances and biomass of Zebra and Quagga Mussels. Over the past 15 years, densities of *Diporeia* spp. have declined dramatically lake wide and Quagga Mussels have expanded their abundance and distribution,

largely replacing Zebra Mussels throughout the lake. The United States Environmental Protection Agency (USEPA) Great Lakes National Program Office samples nutrients and zooplankton at 11 offshore stations around the lake twice annually. Monitoring has documented substantial declines in Lake Michigan offshore productivity (now similar to Lake Superior) and established a link (via silica cycling) between lower productivity and the expansion of the Quagga Mussel population.

Much of the nutrient and lower trophic level research in Lake Michigan occurs on a 5-year cycle coordinated through the Cooperative Science and Monitoring Initiative (CSMI), a bi-national monitoring and research effort to improve understanding of aquatic ecosystems in each of the Great Lakes. The next Lake Michigan CSMI is scheduled for 2015 and will focus on nearshore and offshore food web linkages.

Illinois participates in the Lake Michigan Monitoring Coordination Council, which provides a forum to identify data gaps, establish monitoring priorities, exchange information and form partnerships among Lake Michigan scientists and managers. The Council also promotes standardized methodologies for collection and management of data.

Status of Lake Michigan Coast and Terrestrial Habitats

Shoreline

The Illinois coast has been significantly altered as urbanization spread through northeastern Illinois through the last century. The mix of armored and natural stretches of shoreline has changed the dynamics of coastal processes including the natural movements of sediments along the shore. More recently, weather patterns, extreme storm events, changing water levels, and additional man-made infrastructure have exacerbated erosion and accretion along the coast, especially from Evanston north to the Wisconsin State Line. Illinois Beach State Park is the most unaltered stretch of shoreline in Illinois, and is experiencing significant erosion that has resulted in the loss of high quality beach, dune and wetland habitats. This problem is accelerating and threatens to erode away portions of the designated Illinois Nature Preserves that contain the highest quality habitats and rarest species found in the Illinois coastal area.

The other aspect of this dynamic is that sand eroded from Illinois Beach State Park and other areas causes a build-up of sand downdrift (south in the direction of predominant littoral current), which causes problems with water intake structures, access to ports, and increased dredging costs. However, the accretion in the Waukegan area has allowed the development of an additional 30-40 acres of dune and swale habitat that is supporting rare and endangered plants and animals.

Lake Michigan Migratory Flyway

Lake Michigan and the coastal area are located in the Mississippi Flyway. This migratory route extends from the Mackenzie Valley in northwest Canada, along the Great Lakes, and down the Mississippi River Delta. Twice a year, millions of birds, representing more than 250 species, use this flyway to migrate to their more southerly wintering grounds in the fall and back to their breeding grounds in the spring. Wetlands and forests throughout our region provide critical stopover habitat where these birds find shelter and food during the day before continuing their migration from dusk until dawn. The nearshore wetlands, forests and shrublands are particularly important for migratory birds as many migrate over the water at night and rest onshore and refuel during the day. Often covering thousands of miles each season, migration represents the highest period of mortality of these birds' life cycles due to a lack of stopover habitat and collisions with manmade structures. Compounding these threats is climate change, which disrupts food availability during migration and is changing the suitable climatic range for migratory species. Deforestation and habitat loss is the most significant threat in these birds' neotropical wintering habitat.

Monarch Butterflies and several species of bats also use the Lake Michigan shoreline as a migratory route. Tree roosting species of bats, including Eastern Red Bats and Silver-Haired Bats, have been documented colliding into buildings, towers and power lines along the Chicago lakefront during migration. Collisions with manmade structures, often caused by bright lights or reflective glass that draw in and confuse migrants, and the loss or degradation of stopover habitat are among the biggest risks for all migratory species. Since the mid-1990's, a "Lights Out" program in Chicago has encouraged building owners and managers of tall buildings to turn off or dim their decorative lights after 11 p.m. during migration, which helps. This program, combined with other efforts to reduce window collisions, has prevented thousands of migrant deaths.

Invasive Species

Many invasive species are a significant threat to nearly every aquatic and terrestrial natural habitat covered by this campaign. The Invasive Species Campaign addresses threats, impacts, and needed actions on a statewide level and other IWAP campaigns (Forest and Woodland, Green Cities, Streams, Wetlands and Prairie and farmland) address priority invasive species in specific habitats pertinent to the Lake Michigan Coastal Campaign.

The following invasive species are specific to, or a high priority threat to terrestrial and aquatic habitats within the Lake Michigan Coastal Campaign area:

- Phragmites (*Phragmites australis*)
- Narrowleaf Cattail (*Typha angustifolia*) and hybrids
- Round Goby (*Neogobius melanostomus*)
- Zebra mussel (*Dreissena polymorpha*) and Quagga mussel (*Dreissena bugensis*)
- Exotic waterfleas including spiny waterflea (*Bythotrephes longimanus*) and fishhook waterflea (*Cercopagis pengoi*)

- Sea Lamprey (*Petromyzon marinus*)

Primary terrestrial habitats

Within the Lake Michigan Coastal campaign boundary, there are three primary areas of species and habitat concentration that are surrounded by varying levels of urbanization: the Illinois Lake Plain, the Ravines, and the Calumet region. These three areas hold the greatest potential for diverse species conservation efforts, although the importance of urban, suburban and exurban habitats should not be underestimated or ignored. The more urbanized areas are being addressed in the Green Cities IWAP campaign, though some of the actions identified in this campaign span the full range of habitats throughout the coastal region. The following is a brief description of the three primary habitat areas in the terrestrial coastal region along with description of ongoing projects focused on habitat management.

Zion Beach Ridge Plain Habitat

The Zion Beach Ridge Plain includes over 4,000 acres of contiguous high-quality natural area including: Illinois Beach State Park owned by IDNR; Spring Bluff Nature Preserve owned by the Lake County Forest Preserve District; the Zion Park District; property of the former Johns Manville manufacturing plant; and undeveloped portions of property near the decommissioned Zion Nuclear Power Station owned by Exelon Generation Company (parent company of Commonwealth Edison). This extensive complex contributes significantly to national and regional biodiversity, preserves coastal wetland ecosystems, and provides critical habitat for declining plant and animal species.

Illinois Beach State Park and Spring Bluff Nature Preserve support 14 natural community types as identified by the Illinois Natural Areas Inventory (INAI), including 66 acres of rare and globally declining pannes, and habitat for more than 500 species of plants and 300 species of animals.

In recent years, the conservation landowners and regional practitioners and organizations have partnered to form the Lake Plain Habitat Restoration Partnership. This is a bi-state project with the goal of completing landscape-scale restoration across jurisdictional and property boundaries in Lake County, Illinois and Kenosha County, Wisconsin. Funding through the Great Lakes Restoration Initiative (GLRI) has allowed the partnership to restore and protect over 2,500 acres of coastal wetlands and prairies by preventing the spread of invasive plant species and restoring hydrology, thus improving the long-term sustainability of this natural area for the enjoyment of local citizens and the thousands of tourists this coastal area attracts annually.

Significant projected outcomes of this project include:

- 1,200 acres of nature preserve protected by control of invasive plants at their “leading edge” and eradication of invasive plants that are potentially invasive in the Lake Plain
- 2,000 acres of invasive cattail, Phragmites and buckthorn controlled.
- Eradicated and contained 10 early detection invasive plant species across 59 populations from the Lake Plain.
- 790 feet of gravel roadway removed to reconnect habitat for the federally-listed Eastern prairie fringed orchid.
- Coordination of Lake Plain restoration with upstream watershed improvement projects to develop a more comprehensive watershed management approach.
- Basic Wildfire Training provided to 55 local partners to increase capacity for controlled burns in the Lake Plain.

Illinois Ravines

Ravines are an important and unique feature in the northern part of the Lake Michigan Coastal campaign boundary. Long-term wave erosion along morainal upland has resulted in bluffs that form the highest and steepest landscape along the Illinois coast. Stream erosion has carved steep-sided ravines into these bluffs. Ravines originate as much as one mile inland from the shore and typically have intermittent streams that discharge to the lake.

The 47 steep-sided ravines located along the northern coast of Lake Michigan support groundwater-fed growing conditions and microclimates and offer habitat for unique communities of plants and animals. The topography and positioning of the ravine systems provide the right conditions for several threatened and endangered northern plant and tree species rarely found this far south. Managing the ravines to address the stormwater runoff and the erosion associated with it is a significant challenge, especially for the ravines surrounded by urban development.

Work has been ongoing in some ravines to properly manage the habitat, but other ravines are in need of management actions. Some municipalities (such as Highland Park), organizations (such as Alliance for the Great Lakes), as well as private landowners have been actively involved in ravine projects to restore and protect ravine habitat. Projects completed or ongoing include daylighting of streams in the ravines, stream restoration, erosion control, and education and outreach about ravine management. However, there are multiple ravines lacking management and many of them are faced with severe erosion and habitat degradation.

Calumet Region – Millennium Reserve

The Calumet region is located in the southern section of the Chicago Lake Plain. Historically, the Calumet region contained a wide variety of coastal, wetland, and upland habitats within a small geographic area. This habitat diversity resulted in a biodiversity hotspot, hosting many endemic

plant and animal species. The area still supports some of the richest biodiversity in Illinois and is an important stopover location for migratory species, although the habitat has been significantly altered from its natural state; first by industrial development in the early 20th Century, and then by insufficient ecological management of remaining natural areas. The region has also suffered disproportionately from fragmentation and residential and industrial development, leaving the existing remnants especially vulnerable to terrestrial invasive species. Actions such as fire suppression and lack of invasive control continue to threaten habitat. Protection of this high biodiversity was one of the driving forces behind establishment of Millennium Reserve – a new initiative focused on the protection and reinvigoration of the economy, environment and communities of the Calumet region in Illinois.

Millennium Reserve is a shared vision that unifies public, nonprofit, and commercial leaders seeking to make the most of the region's assets. It is an ongoing initiative guided by partners who understand community priorities, and it is designed to make on-the-ground projects happen. The initiative includes projects that range in scale from neighborhood-based to those of regional significance. Millennium Reserve recognizes the work of partners, particularly those whose decades-long commitment to the region have created the foundation for this initiative.

As part of Millennium Reserve, five major landowning agencies entered into an agreement to bring together their resources and expertise for common management of high-quality natural areas in the Reserve. The goal of the Conservation Compact (the Compact) is to restore and preserve high-biodiversity habitat in Illinois' Calumet region. The Compact deals specifically with sites listed on the Illinois Natural Areas Inventory, locations of outstanding biodiversity identified by the State's experts.

Since the project began in early 2015, Compact partners have committed to coordinating conservation actions to reduce invasive species across this fragile archipelago of sites. Partners are using a combination of time-tested strategies and innovative techniques directly applied to the control of invasive plants, from herbicide and prescribed burning to hydrologic improvements and work by Chicago Greencorps, a community-based job-training and conservation program. The anticipated result will be improvements in habitat quality that translate to regional benefits for declining species, particularly wetland-nesting birds, prairie flora and fauna, and species associated with Midwest savanna communities.

Programs and Initiatives

Great Lakes Restoration Initiative

Launched in 2010, the Great Lakes Restoration Initiative (GLRI) has provided approximately \$300 million in federal funding annually to clean up legacy chemical pollution at Areas of Concern (AOCs), battle invasive species, reduce nutrient input and restore habitat for native

species throughout the Great Lakes Basin. Illinois has benefitted from the Initiative in numerous ways:

- The IDNR has expanded its Aquatic Nuisance Species Management Program by leading a multi-agency effort to prevent Asian carp from entering Lake Michigan via the Chicago Area Waterway System and establish a law enforcement investigative unit to stop invasive species including Asian carp from entering the lake via alternative pathways (e.g., live fish markets, bait shops and the pet trade).
- The US Army Corps of Engineers has completed or is in construction phase on several habitat enhancement projects through the Great Lakes Fishery and Ecosystem Restoration Act (GLFER; e.g., 63rd Street Beach, Northerly Island, Jackson Park, Ravine 8L, Ft. Sheridan and Openlands Lakeshore Preserve, Burnham Annex and Burnham Prairie). Additional GLFER projects have been proposed for Illinois, but they remain inactive due to a lack of non-federal matching funds.
- Research projects mapping substrates and hydrodynamics at offshore Lake Trout spawning reefs and identifying sources (wild vs. hatchery) of unmarked Lake Trout sampled in Illinois waters have been completed with funding from the Great Lakes Fish and Wildlife Restoration Act (GLFWRA) administered by the US Fish and Wildlife Service.

Significant funding has been directed to clean up the Waukegan Harbor AOC. Since 2011, three Beneficial Use Impairments have been removed at Waukegan Harbor and all management actions that were needed to address PCB contamination in the harbor were completed in 2014. This AOC will be delisted when the results of monitoring show that the benthos, phytoplankton, and zooplankton communities are not impaired and that there are no differences in fish consumption advisories between Waukegan Harbor and Lake Michigan as a whole.

Illinois Coastal Management Program

The Illinois Coastal Management Program (ICMP) of the IDNR was officially established in 2012 to protect and manage the natural and cultural resources along the 63 miles of Illinois Lake Michigan shoreline. ICMP is federally funded by NOAA and USEPA. This new funding source allowed IDNR to expand its role and its investment in managing the Coastal region. An important goal of ICMP is to increase the capacity of our coastal communities to balance human and ecological needs through investment in programs that seek to restore our ecosystems and meet the increasing demands for open space, recreation, and public access. This is achieved by supporting and coordinating partnerships among local, state and federal agencies and organizations, engaging in the planning and land management activities, assisting entities with compliance with federal mandates, increasing public awareness and involvement in coastal resource protection, along with on-the-ground restoration and enhancement of our coastal resources.

This new program has brought new resources to supplement habitat management, invasive species control and sustainable land use planning on state-managed lands and natural lands owned by partner agencies such as the Forest Preserve District of Cook County, Chicago Park District, Lake County Forest Preserve District and coastal municipalities. Significant investments have been made in education, outreach and stewardship related to habitat protection and management of Lake Michigan and the coastal area. In addition, ICMP is addressing non-point source pollution issues by raising awareness through education and outreach, and direct improvements with programs like Illinois Clean Marinas, and grant-funding for on-the ground planning and implementation of green infrastructure practices. These actions help to improve water quality in the lake and its tributaries, and provide additional habitat areas.

STRESSORS/THREATS

Habitat Stresses:

Extent (amount of habitat)

- Urban development and extensive hardened shorelines reduce available habitat.
- High density human population and associated impacts on lands and waters that can disrupt species life cycle needs and activities. (e.g., noise pollution, light pollution, and human traffic through natural areas, etc.).
- Narrow approaches to capital development result in missed opportunities to incorporate habitat features into capital improvements (e.g., road and trail projects, marina design, and streambank and shoreline stabilization projects)

Fragmentation, isolation, juxtaposition, patch size and edge effects.

- Habitat fragmentation and reduced connectivity increases mortality and decreases recruitment of young (e.g., road mortality of Blanding's Turtles).
- Limited options for protection, restoration, increased connectivity, and enhancement of habitat because of extensive urbanization, development, hardened shorelines, and waterways that are channelized with vertical sheet pile banks or diverted underground into a culvert, pipe, or drainage system.

Composition-Structure

- Limited availability of technical assistance and funding for active habitat management by public and private landowners, and both residents and corporate entities

- Habitat composition/structure degraded due to invasive species (e.g. Quagga Mussels, Emerald Ash Borer) and diseases (e.g., Oak wilt).

Disturbance/Hydrology, frequency, timing and intensity of disturbances

- Altered wetland hydrology has resulted in the loss of hemi-marsh habitats and subsequent declines in wetland bird populations.
- Climate change alters water levels, water temperatures, shoreline stability (due to increased storm frequency and intensity), and effects habitat quality and species composition.

Invasive/Exotic species

- Abundant populations of aquatic invasive species, (e.g., Dreissenid Mussels, Spiny Water Flea, Round Goby and Sea Lamprey) cause disruptions in the lower trophic level food web, degrade habitat and displace native fish species, including SGCN.
- Abundant terrestrial invasive species that displace native species, change the structure and function of natural communities, and affect life cycle needs of native species.

Pollution – Sediment:

- Bioaccumulative and toxic contaminants from industrial legacy found in Lake Michigan, waterways, ponds and terrestrial areas (brownfield sites) impact habitat quality and survival of organisms
- Non-point source pollution from combined sewer overflows; stormwater runoff; and atmospheric deposition degrade water quality and impair aquatic habitats.

Community Stresses

Predators

- High nest failure of birds and turtles is exacerbated by urban-adapted meso-predators such as raccoons.

Population Stresses

Dispersal:

- Lack of hydrologic and biological/ecological connectivity between the lake and coastal wetland and tributary habitats impedes fish and wildlife reproduction.

Recruitment:

- Foreign debris, manmade structures, and sand deposition at ravine and small tributary outlets, along with artificially steep gradients, impede fish access to spawning habitat in coastal streams and wetlands.
- Declines in native pollinator populations due to habitat loss, fragmentation, invasive plants, non-native landscaping, and insecticides.
- Habitat fragmentation and reduced connectivity increases mortality and decreases recruitment of young (e.g., road mortality of Blanding's Turtles).

Direct Anthropogenic Stresses

Disturbance, direct harassment by humans

- Impacts on species and habitat from recreational use of sensitive areas (e.g., nest disturbance, trampling, dispersal of invasive plant seeds, and litter).

Structures-Infrastructure:

- Reduced survival of migratory birds due to threats such as collisions with buildings.
- Road mortality.
- Limited understanding of littoral drift dynamics and effects on nearshore habitat and SGCN from the construction of shore protection structures, groins and landfills impairs our ability to assess impacts of proposed projects.
- The interaction between human structures, natural coastal processes, and intensive weather events causes detrimental erosion of dune and ravine habitat and lakebed down cutting.

Additional challenges to implementation:

- Lack of knowledge of the amount and quality of available aquatic habitats (e.g., nearshore and offshore reefs, submersed aquatic vegetation and rocky shoals/substrates) impedes our ability to protect important habitats, or build/modify habitat as needed
- Lack of a secure and consistent funding mechanism, particularly with State/private dollars needed to match federal funding.

Focal Species in Greatest Need of Conservation

Piping Plover (*Charadrius melodus*)

- Common Tern (*Sterna hirundo*)
- Red-headed Woodpecker (*Melanerpes erythrocephalus*)
- Sedge Wren (*Cistothorus platensis*)

- Black-crowned Night-heron (*Nycticorax nycticorax*)
- Hoary Elfin (*Callophrys polios*)
- Mudpuppy (*Necturus maculosus*)
- Blanding's Turtle (*Emydoidea blandingii*)
- Lake Trout (*Salvelinus namaycush*)
- Mottled Sculpin (*Cottus bairdii*)
- Cisco (*Coregonus artedii*)
- Banded Killifish (*Fundulus diaphanus*)

Actions

Actions included within this campaign can be divided into Universal Management Recommendations and Targeted Actions. Universal Management Recommendations are on-the-ground practices that will benefit Illinois wildlife species, including SGNC, wherever they are implemented. Anyone that values wildlife and wants to contribute to meeting the overarching goals of the IWAP should consider implementing these practices where applicable. The Targeted Actions are specific, often place-based, actions designed to address a particular need, stressor, or situation.

Universal Actions:

Need: Improve wildlife populations and habitat, as appropriate and realistic, within the Lake Michigan and Coastal Area Campaign boundaries.

- Prevent, minimize and mitigate non-point source pollution and debris in the coastal area; develop, update, and implement watershed plans.
- Promote use of native species for landscaping and gardening, particularly butterfly host plants and assortments of native wildflowers that provide food for pollinators throughout the entire growing season.
- Promote remediation and restoration of contaminated sites, especially in or adjacent to important fish and wildlife areas.
- Encourage strategies to reduce the amount of road salts that get washed into streams, wetlands, and lakes.
- Reduce combined sewer overflows.
- Preserve and protect high-quality natural areas.
- Work with state and federal partners to establish contingency plans for oil or other toxic spill response or other environmental catastrophes.

Expected outcome: Improved aquatic and terrestrial quality, resulting in enhanced fish and wildlife populations.

Need: Increase knowledge, understanding, and concern about fish, wildlife, and habitat threats and challenges in Lake Michigan and coastal area, and increase amount and diversity of citizen participation in targeted conservation actions.

- Support and promote outreach and education that raises awareness about important species, habitats, and functions.
- Promote citizen science to collect data on focal species and habitats (e.g., fishing participants, butterfly monitors, Plants of Concern (POC) monitoring, BugGuide, and Great Lakes Fish Finder app., etc.)

Expected outcome: increased interest, participation and advocacy for targeted conservation actions by Chicagoland residents.

Targeted Actions Benefiting Multiple SGCN:

Publicly Owned and Protected Lands:

Need: Publicly owned and protected lands, such as forest preserves and state and local parks provide the permanent land base for wildlife in the Campaign area. Maintenance and improvement of habitats on these lands is needed to ensure that these habitat anchors in a matrix of urbanized and privately owned lands will support viable populations of target wildlife.

- Maintain or improve habitat quality through appropriate management actions, utilizing best management practices, with a primary focus on key habitat types for SGCN.
- Expand (where possible), restore, and/or improve coastal wetlands throughout the region.
- Assist coastal communities and park managers to minimize non-point source runoff and beach debris; improve beach and dune habitat management; and encourage protection of beach areas of high importance to target species.
- Continue to implement fire management policies that are sensitive to lifecycles and habitat needs of SGCN (e.g., hoary elfin, and Blanding's Turtle, etc.).
- Implement setbacks and buffers, where feasible.
- Reconnect a minimum of one wetland and one tributary to the lake.
- Identify and pursue strategic opportunities to connect or expand protected public lands through land acquisition, easements, and other long-term conservation strategies.

Expected outcome: Improve quality and connectivity of habitat for target SGCN on public lands

High Priority Privately Owned Lands:

Need: Privately owned land makes up a significant portion of the overall landscape in the Campaign area, and some areas provide significant habitat benefits and opportunities for wildlife. Because private land is critical to protecting and improving populations of SGCN, so there is a need to understand overall habitat and connectivity needs and partner with private landowners to protect and improve high priority habitat areas.

- Identify key locations for strategic habitat connection or expansion, or to fill habitat gaps and do strategic landowner outreach to provide information and assistance.

- Determine potential lands for acquisition/conservation easements.
- Promote and support appropriate restoration and management action on private lands.
- Focus outreach, communication, and technical assistance to ravine landowners to promote and support improved ravine habitat management.
- Seek opportunities to work with industrial/commercial landowners to expand and improve habitat for SGCN

Expected outcome: Improved connectivity of quality habitat areas and an increase in overall quantity of habitat area on privately owned lands.

Benchmark/measure – develop outreach plan for ravine landowners based on previous work and studies. Determine percentage of landowners to be contacted

Migration Corridor:

Need: The Lake Michigan shore is a major migratory corridor, especially for birds, but also for bats, butterflies and other flying organisms. Illinois' shoreline is particularly important because intensive Chicagoland urbanization funnels migrants through a fairly narrow band – only 1-2 miles from the lakeshore. Human use and numerous structures and obstructions pose many perils for these migrants. There is a need to mitigate and minimize hazards to migrants through this important corridor and provide improved quality and quantity of stopover habitat to improve the likelihood of safe passage for these important and often imperiled species.

- Conduct an analysis of migratory bird habitat within 1-2 miles of the lakefront to identify opportunities for improving the quality of existing stopover habitat and filling critical gaps where habitat could be created.
- Promote bird and bat-friendly building design and management for communities and lakefront developments. This includes non-reflective windows and implementing and expanding “Lights-out” programs.
- Maintain and restore stopover sites for migratory insects.
- Encourage retrofitting of communication towers with strobe or “bird safe” lighting technology.
- Protect and expand migratory stop-over sites to increase proximity or connectedness; promote structural and successional diversity through management actions; and improve quality by using and promoting appropriate and beneficial trees, shrubs and plants, such as those identified by Audubon-Chicago Region. Work with municipal planners, park and forest preserve districts and others.
- Monitor impact of bird and bat collisions using standard protocols.
- Improve understanding of habitat needs for non-bird migrants and begin incorporating new knowledge into management planning and actions.

Expected Outcome: Decreased mortality of birds and other migrants, increased availability of habitat patches, and improved composition of habitat that provides high-energy food, adequate shelter, and protection for migrants travelling through the Illinois coastal area.

Benchmark/measure- Complete analysis of suitable migratory habitat patches and gaps, Identify 5 migratory habitat gaps and complete installation of habitat using appropriate Audubon guidelines.

Shoreline and Connectivity:

Need: The Illinois shoreline has been significantly changed by urbanization and various aspects of development and modifications for shore protection, expansion, drainage and other human uses. These modifications have changed natural and structural processes and connectivity between the coastal uplands, lowlands and the lake, resulting in impacts to aquatic and terrestrial habitats, infrastructure and shoreline stability. There is a need to better understand the singular and cumulative impacts of these modifications to species and habitats and restore or improve functionality for SGCN that is both sustainable and compatible with human needs and uses.

- Find a sustainable long-term solution or strategies to severe erosion and loss of habitat at Illinois Beach State Park. Structural erosion controls should be selected and implemented with careful consideration of potential impacts on habitat for focal species.
- Determine impacts of modified littoral drift and lake-shoreline dynamics, including shoreline erosion and accretion; develop sustainable strategies to improve habitat functionality for SGCN while maintaining human uses including public access for recreation; and work with coastal communities and land managers to implement those strategies.
- Encourage the reconnection of ravines with Lake Michigan to allow movement of fishes and other organisms between the two systems. Ravines, even those with seasonal water flow, are potential spawning sites. Ravine mouths can provide sheltered areas for SGCNs, such as the Banded Killifish.
- Incorporate habitat features in shoreline stabilization and beach-saver structures
- Maintain hydraulic and biological connectivity between Lake Michigan and coastal tributaries and wetlands
- Incorporate fluctuating Lake Michigan water levels, and the possibility of dropping water levels with future climate change, into nearshore infrastructure plans. This includes wetland restoration and tributary re-connection projects.

Expected outcome: Improved shoreline management, including connectivity to upland and lowlands, that is sustainable, maintains natural processes, and improves habitat for SGCN.

Research and Analysis:

Need: There is a need to continue researching and refining knowledge to improve understanding of biotic and abiotic factors that affect important habitats and SGCN. Appropriate research will inform and direct management actions to improve long-term viability of fish and wildlife in Lake Michigan and the coastal area of Illinois.

- Identify specific functional habitats and the anthropogenic stressors limiting healthy populations of SGCN.
- Identify and inventory potential priority management areas or specific habitats (e.g., offshore reefs) for protection and improvement.
- Support research on deep-water communities, particularly foodweb dynamics. This would include SGCN fishes, *Diporeia* spp., and impacts from invasive species.
- Investigate the role Round Goby plays in the Lake Michigan ecosystem, both pro (food for Lake Trout, basses, and Lake Whitefish, etc.) and con (competition with Yellow Perch, darters, Mottled Sculpins, other sculpin species, etc.).
- Map nearshore aquatic substrate types to determine rarity or commonality of various forms of habitat. Refine species-habitat associations.
- Research potential impacts of off-shore wind energy development on SGCN and assess potential siting criteria.
- Determine effects of regulatory activities on SGCN as feasible and appropriate.
- Conduct or support invasive species research and monitoring on:
 - Zebra Mussel
 - Quagga Mussel
 - Sea Lamprey
 - Round Goby
 - Spiny Water Flea
 - Fishhook Water Flea
 - Emerging invasive species

Expected outcome: Improved understanding of biotic and abiotic factors that affect important habitats and SGCN and enhanced knowledge of species-habitat associations leading to better informed and managed habitat restoration actions and sustained population viability of SGCN.

Monitoring and Assessment Actions:

Need: There is a need to assess and/or monitor lands, waters, and species groups for which there is little information or to assess trends that can inform management and habitat improvement actions to enhance populations of SGCN.

- Continue to assess, monitor, prioritize, and seek remediation funding for areas with contaminated soil and sediments.
- Develop standardized monitoring protocols to assess trends in abundance and species composition of small-bodied, non-game fishes in the Lake Michigan nearshore zone.
- Survey and monitor aquatic invertebrates, including mussels, snails (such as *Aplexa elongate*), aquatic insects (larval distribution), and other lower trophic level taxa, etc.
- Continue to monitor fish populations.

Expected outcome: Improved understanding of the effects of current conditions and management actions on SGCN or surrogates, and the necessary information to evaluate habitat protection and enhancement projects and design adaptive management actions for SGCN.

Targeted Actions Benefitting Priority SGCN

Forest and Woodlands: Dry Sand Savanna, Dry-mesic Sand Savanna

Focal Species: Red-headed Woodpecker (*Melanerpes erythrocephalus*), Hoary Elfin (*Callophrys polios*)

Need: Improve and increase management of existing savanna habitat and expand and enhance savannas, where possible, to expand populations of SGCN that use this habitat.

- Continue savanna restoration efforts including prescribed burning, thinning, and invasive species control to maintain structure and function of community.
- Maintain snags as part of woodland management.
- Maintain open savannas through timber stand improvement and thinning.
- Remove invasive species that affect structure and function of habitat.
 - Buckthorn, Honeysuckle, Garlic Mustard.
- Plant native shrubs.
- Plant host plants for Hoary Elfin butterflies.
- Increase the width of habitat corridors and improve connectivity of corridors.
- Emerald Ash Borer planning and mitigation.

Expected outcome: Increased amount, connectivity, and quality of savanna habitat and increasing populations of Red-headed Woodpecker, Hoary Elfin, and other savanna-dependent SGCN.

Wetlands: Marsh, Sedge Meadow

Focal Species: Blanding's Turtle (*Emydoidea blandingii*), Sedge Wren (*Cistothorus platensis*), Black-crowned Night-heron (*Nycticorax nycticorax*), Banded Killifish (*Fundulus diaphanus*)

Need: Improve and increase management, including hydrology and connectivity, of existing marsh and sedge meadow habitat and expand and enhance wetlands, where possible, to benefit populations of SGCN that use this habitat. Minimize and mitigate effects of fragmentation, human interactions and urban infrastructure on wetland function and species mortality.

- Control invasive plants.
 - Phragmites, narrowleaf cattails, reed canary grass, purple loosestrife.
- Implement strategies to reduce wildlife road mortality such as flat-bottomed culverts, guide fencing, speed bumps, reduction in speed limits, caution signs (e.g., “Watch for Turtles”).

- Implement strategies to increase recruitment of Blanding's Turtles, such as head starting, predator reduction, and nest protection. Increase adult survivorship through appropriate means.
- Maintain healthy native aquatic vegetation in swales.
- Support activities to maintain and improve wetland hydrology to sustain diverse natural habitats and support Black-crowned Night Heron nesting habitat.
- Improve and restore hemi-marsh conditions (e.g., Calumet Region) through the removal and control of invasive species and improved ability to manage water levels. Improve quality, diversity and structure of sedge meadow and bulrush communities.
- Ensure connectivity between wetlands and upland grasslands adjacent to wetlands to attract breeding bitterns and King Rails and provide nesting habitat for Blanding's Turtle
- Maintain wetland connectivity with nearby water bodies, such as Lake Michigan, streams, or inland lakes.
- As feasible, exclude Common Carp from wetland restoration sites to protect native plants as they become established, and eradicate from high quality established wetlands.
- Study habitat use, movement patterns, and home range of Blanding's Turtles throughout the Lake Plain to identify focal areas and promote habitat connectivity and conservation actions.

Expected outcome: Increased amount, connectivity, and quality (including improved or restored hydrology) of marsh and sedge meadow habitat; and increasing populations of Blanding's Turtle, Sedge Wren, Black-crowned Night-heron, Banded Killifish and other wetland-dependent SGCN.

Lake Michigan: Bedrock Outcrops, Cobble Reefs

Focal Species: Mudpuppy (*Necturus maculosus*), Lake Trout (*Salvelinus namaycush*), Mottled Sculpin (*Cottus bairdii*), Cisco (also called Lake Herring; *Coregonus artedii*)

Need: Identify and protect bedrock outcrops and cobble reefs and expand and enhance this habitat structure and function, where possible, to improve populations of SGCN that use this habitat. Minimize and mitigate effects of water pollution, invasive species, and other stresses on habitat function and species mortality.

- Incorporate rocky habitat features into shoreline stabilization and beach-saver structures, taking into consideration the size and shape of stones and size of spaces between stones to provide cover and protective habitat for Mudpuppies and Mottled Sculpins.
- Pollution prevention: Implement Total Maximum Daily Loads and best management practices to reduce bacterial and nutrient pollution, siltation and sedimentation. These actions benefit SGCN by preventing hypoxia (currently an issue in Wisconsin) and reducing the risk of avian botulism.
- Identify and protect nearshore rocky shoals important for fish spawning; prevent negative impacts to rocky bottom habitats.

- Support ongoing regional efforts to monitor and rehabilitate Cisco and Lake Trout populations in Lake Michigan
- Investigate the feasibility of building nearshore spawning reefs or enhancing existing reef habitat, as needed, in support of Cisco and Lake Trout rehabilitation.
- Support targeted Sea Lamprey control efforts to limit losses due to predation by parasitic adult lamprey.
- Monitor developments in Zebra and Quagga Mussel control under consideration by the Invasive Mussel Collaborative.

Expected outcome: Expanded availability of rocky habitat, decreased effects of stressors on habitat function and expanded populations of mudpuppy, Lake Trout, Mottled Sculpin, Cisco and other SGCN dependent on rocky habitat for one or more life stage.

Lake Michigan: Submersed Vegetated Areas

Focal Species: Banded Killifish (*Fundulus diaphanus*)

Need: Identify and protect areas of submersed aquatic vegetation and expand and enhance this habitat structure and function, where possible, to improve populations of SGCN that use this habitat. Minimize and mitigate effects of water pollution, invasive species, and other stresses on habitat function and species mortality/survival.

- Establish submersed aquatic vegetation in sheltered areas of the lake, where feasible, to promote invertebrate production and fish nursery habitat.
- Study and implement green marina solutions that provide fish habitat and decrease herbicide use while balancing the interests of recreational watercraft users.
- Maintain hydrologic and biological connectivity between Lake Michigan and coastal tributaries and wetlands.
- Pollution prevention: Implement Total Maximum Daily Loads and best management practices to reduce bacterial and nutrient pollution, siltation and sedimentation. These actions benefit SGCN by preventing hypoxia (currently an issue in Wisconsin) reducing the risk of avian botulism, and preventing sedimentation of submersed vegetated areas.

Expected outcomes: Improved and expanded areas of submerged aquatic vegetation, increased hydraulic conductivity to these areas, and expanded populations of Banded Killifish and other SGCN that utilize aquatic vegetation spawning, nursery, feeding or protective cover.

Ravines

Focal Species: Red Headed woodpecker (*Melanerpes erythrocephalus*), Banded Killifish (*Fundulus diaphanus*)

Need: Increase awareness of the habitat value of the Illinois ravines; improve management and enhancement of existing ravine habitat, expand connectivity to the lake and other habitat, where possible, to improve populations of SGCN that use the ravines.

- Mitigate stormwater inflows.
- Target ravines with erosion issues for restoration.
- Replace invasive plants with native species.
- Encourage and incentivize active management by private landowners.
- Encourage the reconnection of ravines with Lake Michigan, facilitating the movement of fishes and other organisms between the two systems. Ravines, even if water flow is seasonal, are areas of potential spawning opportunities. Ravine mouths can provide sheltered areas for SGCNs, like Banded Killifish.

Expected outcomes: Improved habitat conditions and connectivity in the ravines and expanded populations of Red Headed Woodpeckers, Banded Killifish and other SGCN that use ravine habitats.

Lakeshore Communities: Foredune, Panne, Dune and Swale

Focal Species: Piping Plover (*Charadrius melodus*), Common Tern (*Sterna hirundo*), Hoary Elfin (*Callophrys polios*)

Need: Because of the spatial limitations and specific conditions needed to support lakeshore communities and limitations for expansion due to shoreline modifications, there are limited opportunities to expand these community types. In addition, these lakeshore areas are a magnet for human recreation, use, and development. Therefore, there is a need to protect, maintain and improve existing habitat; identify strategic opportunities for expanding and enhancing these communities, and manage and balance human use and impacts, where possible, to improve survival, reproductive success and population viability of lakeshore-dependent SGCN.

- Control invasive plants including Phragmites and Lyme grass.
- Close existing footpaths that negatively impact dune habitat and create trails and boardwalks to keep foot traffic on designated routes and prevent trampling.
- Promote dune restoration where possible.
- Provide education and outreach on sensitive lakeshore species to lakeshore landowners and users.
- Develop a lakeshore habitat restoration and management guide for landowners of lakefront property.

Expected outcomes: Improved and protected habitat conditions and expanded populations of Piping Plover, Common Tern, Hoary Elfin and other SGCN that use lakeshore habitats.

Beaches

Focal Species: Piping Plover (*Charadrius melodus*), Common Tern (*Sterna hirundo*)

Need: Because of the spatial limitations and specific conditions needed to support lakeshore communities and limitations for expansion due to shoreline modifications, there are limited opportunities to expand these community types. In addition, these lakeshore areas are a magnet for human recreation, use, and development. Therefore, there is a need to protect, maintain and improve existing habitat; identify strategic opportunities for expanding and enhancing these communities, and manage and balance human use and impacts, where possible, to improve survival, reproductive success and populations of lakeshore-dependent SGCN.

- Implement sand nourishment to provide broader beaches for nesting plovers.
 - Frequent surveys to identify shorebird nesting to enable timely predator-proof fencing installation.
 - Captive rearing and release of Piping Plovers.
 - Raise public awareness of the value of beaches as habitat for SGCN.
 - Beach cleanup and litter prevention activities.
 - Implementation of Total Maximum Daily Loads and best management practices to reduce bacterial and nutrient pollution and sedimentation.
 - Research and reduce outbreaks of avian botulism.
-

Actions for other (non-priority) habitats:

Streams and Waterways

(See Streams Campaign for statewide plan and priority actions)

Focal Species: Banded Killifish (*Fundulus diaphanus*)

Need: Streams and waterways are important habitat and connectors to and from Lake Michigan. They often provide corridors of habitat and movement routes throughout the urbanized matrix. There is a need to maintain and expand habitat quality and quantity, and restore functionality, where possible.

- Control and prevent the spread of invasive species
 - Curlyleaf Pondweed, Eurasian Water Milfoil, Dreissenid Mussels,
- Support installation of shoreline habitat
- Promote nonpoint source pollution prevention- including green infrastructure
- Daylight flows where possible
- Remove instream barriers to fish passage where possible, while considering potential negative effects of invasive species with barriers removal.

- Watershed planning.

Expected outcome: Improved habitat quality and water quality and an increase in populations of Banded Killifish and other SGCN that use streams and waterways.

Urban Habitats

(See Green Cities Campaign for statewide plan and priority actions)

Need: Although urban habitats do not support as wide diversity of species as more natural or undisturbed habitats, many species can and do thrive in urban areas. There is a need to improve and increase these habitat patches, where possible, to maintain and increase species diversity and functionality of habitat areas.

- Encourage planting of native, non-invasive trees, shrubs and herbaceous plants in neighborhoods
- Decrease the use of harmful pesticides in urban yards and private lands.
- Promote and implement green stormwater management techniques
- Promote plantings to support and enhance pollinator insects.

Expected outcomes: An increase in functional urban habitat patches that support increase species diversity.

Grassland

(See Grassland and Farmland Campaign for statewide plan and priority actions)

Focal Species: Sedge Wren (*Cistothorus platensis*), Blanding's Turtle (*Emydoidea blandingii*)

Need: Some significant areas of functional grassland habitat exist within the Lake Michigan Coastal Campaign area. There is a need to identify these areas and provide protection and management, where possible, to support grassland-dependent SGCN that use these habitats

- Protect and enhance native grasslands and promote appropriate management strategies
- Identify native and non-native grasslands that provide habitat for migrating birds and other wildlife and provide protection and/or management where possible.
- Provide a matrix of habitat that includes both short open structure and medium thick patches with duff layers

Expected outcome: Increased amount and functionality of grassland habitat, resulting in stable or increasing populations of Sedge Wren, Blanding's Turtles and other grassland dependent SGNC.



Figure 1. Map showing Lake Michigan and Coastal Area campaign boundaries.

Appendix A. Illinois Lake Michigan Coastal Campaign Habitat Associations

These habitat descriptions, modified from the Illinois Natural Areas Inventory Standards and Guidelines (IDNR 2013), are included to illustrate the diversity of this region and provide necessary background information. Additional habitats that are not part of the INAI Standards and Guidelines have been included; descriptions of each were developed by the Coastal Campaign Workgroup.

FOREST CLASS

Upland Forest --The upland forest communities are defined by soil moisture class, which ranges from *xeric* to *wet-mesic*. Upland forests do not normally flood. Forests on terraces are considered upland forests, because (by definition) terraces do not normally flood.

Floodplain forest -- Floodplain forests occur within the floodplains of streams. These dynamic communities are determined by the frequency and duration of flooding, and by the permeability of their soils. Floodplain forests are separated from upland forests because periodic flooding greatly affects the soil, fauna, and flora. The soil moisture classes range from *mesic* to *wet*.

SAVANNA & WOODLAND CLASS

The Savanna & Woodland class includes natural communities intermediate between forest and prairie. This Class includes wooded communities that are more open in nature than forests as a result of either topo-edaphic conditions or past disturbances such as fire. As a whole, this Class contained natural communities that were once among the most widespread and characteristic of the Illinois landscape. Fire suppression has allowed many open wooded communities to succeed to more closed forest communities.

Savanna -- These communities occur on glacial till or loess soils of till plains and lowlands. They are characterized by widely spaced trees and an understory of native grasses, forbs, sedges, and shrubs that require high levels of light. Soil sola are generally deep (i.e., > 50 cm.); canopy cover ranges from 10 to 50 percent.

- **Mesic savanna** -- The moisture level in mesic savannas is the same as in mesic prairie, and the herbaceous vegetation may be similar to mesic prairie. This community is found at the base of morainic ridges and (rarely) as islands in wetland vegetation.

Sand savanna -- Sand savannas are associated with soils that are poor and very sandy, with little humus and low moisture content. Canopy cover ranges from 10 to 50 percent. Sand savannas are associated with dune and swale topography, either dunes or beach ridges. The undulating topography presumably limited the severity of fires and allowed a savanna to develop instead of a sand prairie. The herbaceous vegetation of a sand savanna is quite similar to that of sand prairies. Two sand savanna communities are distinguished by soil moisture.

- **Dry sand savanna** -- The crests of the highest dunes support this community. There is little or no A horizon. Grasses are shorter than 3 feet, and plant species diversity is low.

- **Dry-mesic sand savanna** -- There is some development of an A horizon in this community, because it has a lower topographic position than the preceding community or because it occurs on north-facing or east-facing dune slopes.

Woodland -- The woodland community types are characterized by canopy cover ranging from 50 to 80 percent; soil moisture class ranges from dry to dry-mesic. Stand structure is the result of frequent fire and/or dry environmental conditions that limit forest development. Warm season (C4) grasses generally uncommon, but forbs, sedges, and C3 grasses of prairie, savanna, and open woodland habitats are common. This subclass probably was very common and widespread, but has become less common due to fire absence.

- **Mesic woodland** -- Soils deep and rich; periodic fire required for maintenance of woodland structure. Examples include mesic savannas converted to woodland with > 50 percent canopy cover as a result of fire absence or low frequency. Formerly classified, in part, as mesic savanna and mesic upland forest. This habitat intergrades with mesic savanna; following extended fire absence, converts to mesic upland forest.

Flatwoods -- Flatwoods occur on level or nearly level terrain in landscape position above the floodplain and are underlain by a subsurface layer that limits permeability (hardpan). Soils are low in available nutrients. Poor drainage results in a seasonally perched water table and ponding in microdepressions, especially during the late dormant season. During the summer months, due to evapotranspirational drying of the soil, the habitats can become extremely dry. Because soil moisture fluctuates widely by season, the moisture class is not included in the classification. In sand flatwoods, the slowly permeable horizon (i.e., lakebed) may be below depth of classified soil horizon units. Formerly, all types were classified under Upland Forest.

- **Northern flatwoods** -- Poorly drained uplands on the Valparaiso Moraine include this community. Vernal ponds (ephemeral pools) are characteristic. The abundance of sedge meadow and wet prairie species in modern remnants indicates that many northern flatwoods once had more open canopy structure. These communities may intergrade with wet-mesic upland forest. Distribution: Northern flatwoods are known from glacial moraines in the Morainal Section of the Northeastern Morainal Division.

Prairie Class

Prairie -- includes the typical "black-soil" prairies and prairies on poorer till. Soils are deep and fine-textured, usually silt loam or clay loam derived from loess or glacial till, although the prairies may also occur on alluvium. Prairie communities in some other subclasses (for example, *mesic sand prairie*) may also have soils with deep, dark A horizons, so the term *black soil* is not applicable solely to this subclass. Soil moisture for these prairies ranges from *dry* to *wet*.

Sand Prairie -- Soils in this subclass are coarse-textured: either sand, loamy sand, and sandy loam can support sand prairie. However, prairies on sandy loam are considered sand prairies only if they are acidic enough to have characteristic plants. Sand prairies are found on sandy outwash plains, lake plains, and valley trains. The soil moisture varies from dry to wet.

Dry sand prairie -- The soil in dry sand prairie lacks a dark A horizon, and grass is less than 1 meter tall. Dry sand prairies are rather rare because the proper topographic position for dry sand usually also reduces fire severity enough to allow a savanna to develop.

WETLAND CLASS

The wetland community class includes natural communities that are transitions between aquatic and upland ecosystems that contain permanent standing water, seasonal standing water, or have saturated hydric soils with a vegetative cover. The sub-classes (marsh, swamp, bog, fen, sedge meadow, panne, seep and spring) are recognized mainly by differences in the vegetation caused by soil pH, water depth, and water movement.

Marsh -- This class includes freshwater communities in glacial depressions on lake plains and in stream valleys. Marshes have a wide variety of plant communities. In general, deeper water supports lower plant species diversity. Fluctuations in water levels, fire frequency, and *Ondatra zibethicus* (muskrat) population cycles are also important in determining species composition and structure.

Shrub swamp -- A shrub swamp has a 50 percent or greater coverage by shrubs. A shrub swamp has less than 20 percent tree cover or else it is classified as a swamp. Shrub swamps are often associated with ponds in wet floodplain forest communities. Occasionally, shrub swamps occur in glacial potholes, where they grade into the tall shrub bog community.

Fen -- Peat with calcareous groundwater seepage is necessary for all fen communities. Most fen communities tend to have a rather pronounced slope. They are most closely correlated with calcareous glacial till materials or limestone bedrock and occur in both lake basins and stream valleys. Fens are often found in association with strongly calcareous spring runs as well as such natural communities as calcareous seeps, sedge meadows, and marshes.

Sedge Meadow -- A sedge meadow is a wetland dominated by sedges (*Carex*) on peat, muck, or wet sand. The sedge meadow is remarkably homogenous in composition and structure. Hummocks are indicative of this community. The soil moisture level is analogous to that of wet prairie, and there is some degree of floristic overlap between the two communities. *Carex stricta* (sedge) is the major dominant.

Panne -- This community type is restricted to wet and wet-mesic swales in calcareous sand or the remains of ancient beach ridges or dune and swale topography within one mile of Lake Michigan. This community has considerable floristic overlap with the graminoid fen and the calcareous seep. Competition is not as intense as in fens, because the sod is less dense.

Seep and Spring Subclass -- This community occurs where groundwater flows to the surface. A seep is an area with saturated soil caused by water flowing to the surface in a diffuse rather than concentrated flow. Seeps may have local areas of concentrated flow, and the water usually collects in spring runs. Seeps are usually smaller than 0.1 acre, and are most common along the lower slopes of glacial moraines, ravines, and terraces. A spring, as opposed to a seep, has a

concentrated flow of groundwater from a definite orifice. The various communities in this subclass are separated on the basis of substrate and water characteristics.

- **Seep** -- This is a wetland community with circumneutral water. A tree cover is often present.

OPEN WATER CLASS

Great Lake -- Lake Michigan is a large, deep, naturally oligotrophic body of water, which has suffered some eutrophication and chloride pollution along the Illinois shore.

STREAM CLASS

A stream is a body of water flowing in a channel or water course such as a river or creek.

Although stream communities may intergrade, four community classes are recognized on the basis of size: small stream, medium stream, large stream and major river.

- **High-gradient small stream** -- This is a stream with a gradient of 10 or more feet per mile. Riffles, pools, and sand and gravel beds are characteristic of high gradient small streams. Headwater streams throughout much of Illinois are classified as high-gradient small streams.
- **Medium-gradient small stream** -- A medium-gradient small stream has a fall of between 1 and 10 feet per mile. Since these streams have a slower current than high gradient small streams, they usually have a greater amount of silt deposited in the stream bottom. Medium-gradient small streams are generally distributed throughout Illinois.
- **Low-gradient Small Stream** -- A low-gradient small stream has a gradient of less than 1 foot per mile. The current is sluggish, there are few if any riffles, and the primary bottom sediments are usually silt and organic matter. This community is characteristic of flat prairie uplands and bottomlands.
- **Low-gradient Medium Stream** -- A low-gradient medium stream has a gradient of less than 1 foot per mile with an average width between 21 and 100 feet. The current is sluggish, there are few if any riffles, and the bottom sediments are primarily silt and organic matter.

BEDROCK CLASS

Communities that are established where (1) soil is thin or absent, and (2) the parent material is at or near the surface.

Eroding bluff community -- This community consists of vertical exposures of unconsolidated material (for example, glacial drift) or weak rock (such as shale). The steep slope is maintained by stream or lake erosion, and the natural community is poorly developed because of continual slumping.

SHORE CLASS

The communities in this class are all influenced by Lake Michigan. Lake-deposited sands form the substrate for the beach and foredune communities. These communities are maintained indefinitely at an early stage of succession by the substrate or by natural disturbance. All communities are limited to the shoreline of Lake Michigan.

Beach -- Soil development is nonexistent because the sand is recently deposited. Two basic subdivisions can be distinguished: the nearly bare zone of sand nearest the lake and the vegetated grassland farther inland.

Foredune -- This community is characterized by the beginnings of soil development. A fairly dense cover of low shrubs and grasses is present. There is some floristic overlap with dry sand prairie because of the substrate present.

Additional Lake Michigan Habitats, not recognized in the INAI Standards and Guidelines:

High dune - is above the direct action of waves except by most violent storms but is influenced by blowing sand and spray; water is present several feet below sand. This is a more well-developed natural community than the previous two and is located on tall steep slopes behind the foredune.

Ravines -- Ravines are defined as steep-sided or V-shaped valleys that are larger than gullies but smaller than canyons. They may contain perennial or intermittent streams, but are typically formed when moving water incises and erodes a channel into the underlying material. Seeps flowing out of ravine slopes create an unusual wetland habitat supporting plant species that are uncommon in other areas. The Lake Michigan ravines of northeastern Illinois range from 10 to 75 feet in depth and extend as much as 2 miles inland from the lakeshore. The ravine systems are an important natural legacy, as they represent the only remaining natural drainage systems in the present-day Lake Michigan watershed in Illinois. The unusual terrain of a ravine harbors an unusual climate. Temperatures are typically 10 degrees cooler inside a ravine than on the bluffs or the beach, as lake breezes pour into the exit-less ravines. Many of the plant species found in ravines were probably more common in the area following the retreat of the glaciers 12,000 years ago when the climate was significantly cooler. The ravines now provide some of the only remaining habitat for such plant species in Illinois.

Lake Michigan Habitats

Offshore Habitat (greater than 30 meters in depth)

Pelagic -- This is the largest habitat by volume. It is affected by abiotic factors (e.g., light intensity and seasonal thermal stratification) and invasive organisms, such as Dreissenid (Zebra/Quagga) Mussels, Sea Lamprey and Spiny Water Fleas (Spiny/Fish Hook). Horizontal currents and upwelling can mix materials and organisms. Plankton forms the base of the food web. Historically, native species like Lake Trout, Bloater, Cisco, and others dominated the fish community. Today, non-natives, such as Alewife, Rainbow Smelt, Chinook Salmon, Coho Salmon, and Rainbow Trout are common. This is a very important habitat for fishes with planktonic larvae, including those that spawn nearshore (e.g., Yellow Perch and Alewife). Fish

hatched nearshore are carried in water currents to the pelagic zone where they feed on zooplankton.

Benthic -- These are habitats along the bottom of Lake Michigan, but away from the shoreline. Light levels are low, particularly in the deepest parts of Illinois at 400 feet or so. Typical fishes include Burbot, Slimy Sculpin (moderate depths), Deepwater Sculpin (deepwater), Lake Whitefish, and Lake Trout (forage along bottom). *Diporeia spp.* are an important food organism that has experienced significant declines. Substrates can be roughly classified as soft (sand, silt and hardpan clay) or hard (bedrock and fractured bedrock). Burbot and sculpins will hide in depressions along the bottom, but there are generally fewer species living over soft substrates compared to hard ones.

Reefs and Rock Outcrops -- These areas are most note-worthy for being spawning sites for Lake Trout and Lake Whitefish. Sculpins hide among the crevices, and Burbot and Lake Trout use the areas as foraging grounds. The non-native Round Goby has become more common at offshore reefs in recent years, as has the Quagga Mussel, which can clog interstitial spaces to the detriment of incubating eggs and fry.

Nearshore Habitat (less than 30 meters in depth)

Open Water -- This habitat is shallow enough for light to reach the bottom. Water is generally better mixed than offshore because of weather, wave action, upwelling, and longshore currents. Plankton forms the base of the food web, but because the water is relatively shallow, there are more opportunities to interact with benthic communities. Fish larvae drift throughout the water column. Yellow Perch and Gizzard Shad swim throughout this habitat, although both will forage along the bottom as well. Seasonally, the non-native Alewife, Chinook Salmon, Coho Salmon, Brown Trout, and Rainbow Trout can become common as they move inshore with cooler water temperatures. Mergansers, Pied-billed Grebes, terns, and Double-crested Cormorants dive into the water to forage on fishes.

Benthic -- These are habitats along the bottom of Lake Michigan and near the shoreline. Benthic invertebrates along the bottom are an important component of the nearshore food web. Some ducks (e.g., Mallards) forage along the shallows and piscivorous water birds may be common. The nearshore benthic habitat is structurally the most complex habitat in Lake Michigan because of the variety of substrates. A consequence of this habitat heterogeneity in the nearshore benthic zone is that it has the highest species richness, even though by volume it is the smallest habitat category. Nearshore benthic sub-habitats can be roughly classified as reefs, cobble/gravel, sand/silt, or vegetation.

Reefs refer to rock outcrops or other significant masses of hard substrate. Shipwrecks, piers, breakwalls, etc. fall under this category. Reefs can act as spawning sites for Yellow Perch, Lake Whitefish, and Lake Trout. Typical species living among the spaces between rocks are Smallmouth Bass, Rock Bass, Mottled Sculpin, Round Goby (invasive), Dreissenid Mussels (invasive), Rusty Crayfish (invasive), and Mudpuppy.

Cobble/Gravel refers to basketball-sized stones and smaller scattered along the bottom, often with sand in between. If formed into a pile, it is better described as a reef or rocky shoal. Cobble and gravel is most common in areas impacted by surf. Otherwise the stones tend to be covered by sand and silt. Typical inhabitants are Smallmouth Bass, Rockbass, Longnose Dace, Banded Killifish, and Round Goby (invasive). This is important habitat for fish that spawn in nearshore habitat, such as Yellow Perch and Alewife.

Sand/Silt is the general category for soft substrates along the bottom. In areas exposed to currents or wave action, this is a difficult habitat for plants and animals to live over because the substrate is constantly moving around. It also happens to be very common (e.g., beaches are included in this category). Groins are used to minimize shoreline erosion, which is another way of looking at longshore movement of sand. Potential inhabitants are Sand Shiner, Spottail Shiner, Longnose Dace, Lake Chub and Longnose Sucker.

Vegetation is most common in sheltered harbors and bays where roots have a chance to take hold of the bottom. Vegetation is less common in the exposed portions of Lake Michigan, although reefs can provide cover or solid footing for aquatic plants and algae. In harbors, 'excessive' vegetation is often controlled with herbicide applications. Typical inhabitants include Largemouth Bass, Pumpkinseed, Golden Shiner, and Northern Pike.

Appendix B. Focal Species

Fish

Lake Trout (*Salvelinus namaycush*) – Among the largest native top-level predators in the offshore areas of Lake Michigan. Lake Trout utilize offshore benthic habitat for foraging and are known to spawn on offshore reefs. They may forage seasonally in the nearshore when water temperatures are low and may spawn over nearshore rocky substrates.

Banded Killifish (*Fundulus diaphanus*) – Typically found in water less than 2-3 meters deep. Often associated with vegetation, but in Lake Michigan can also be found among cobble spread over the bottom close to shore. Among the most sensitive fish species that we have found to date in ravine streams (usually near the mouth where there is a permanent water connection with Lake Michigan). Also found in wetlands in the Calumet Region and in dune-and-swale wetlands along the coast. Banded Killifish may serve as a potential indicator of connectivity between Lake Michigan and stream tributaries and coastal wetlands.

Mottled Sculpin (*Cottus bairdii*) – In Lake Michigan, this species is found almost exclusively among rocks (rarely found over sand, mud, vegetation, etc.). Once an important component of the benthic food web, foraging on aquatic invertebrates, and in turn eaten by trout, basses, and other large predators. Mottled Sculpin are facing intense competition from Round Goby. Tend to have different water temperature/depth preferences than the very similar Slimy Sculpin.

Cisco (*Coregonus artedii*) –Also called Lake Herring, this species was once part of the commercial fishery in southern Lake Michigan, but now on the verge of extirpation. There is interest by Lake Michigan managers and throughout the Great Lakes region for Cisco re-introduction programs.

Amphibians

Mudpuppy (*Necturus maculosus*) – Amphibian representative that lives under stones or in thin crevices among rocks. Requires interstitial spaces and cannot survive if the spaces among rocks are filled by sediment. As with other amphibians, the mudpuppy is thought to be sensitive to pollution. Current abundance is well below historical levels, though monitoring has been inconsistent. Mudpuppy habitat is already a focus of many restoration projects along the lakefront. Locally abundant at Wolf Lake.

Reptiles

Blanding's Turtle (*Emydoidea blandingii*)—This species is a medium-sized, semi-aquatic turtle distinguished by its bright yellow chin and throat and mottled shell. Historically common in northern Illinois, they now remain in only a few isolated remnant wetland and grassland complexes. Head-starting programs, monitoring of individuals using radio-telemetry, and the removal of meso-predators, have been management tools used by Lake County Forest Preserves within the Lake Michigan Coastal campaign area to assist with species recovery. The population within the Lake Michigan Coastal Zone is the largest known population of this species in the state and is critical to statewide recovery efforts.

Birds

Piping Plover (*Charadrius melodus*)—Piping Plovers historically bred at Illinois Beach State Park. The first breeding pair in Illinois since 1979 was found nesting in 2009 in Illinois Beach Nature Preserve, Lake County, IL. This federally endangered species is managed under a Great Lakes recovery plan. There is a significant effort at a regional scale to increase and maintain the population in the face of threats including human interference, beach erosion, climate change, and avian botulism.

Common Tern (*Sterna hirundo*)—Common Terns face threats in Illinois including nest predation and high levels of legacy pollutants in the food chain, including PCBs. Human activities on the beachfront are one of the biggest threats to their continued presence. This colony-breeder can be found nesting all over the world, and prefers isolated beaches with limited vegetation.

Red-headed Woodpecker (*Melanerpes erythrocephalus*)—This species prefers open woodlands and relies on snags for nesting. Declines appear to be related to the removal of snags and dead trees, and possibly competition with European Starlings for nesting sites. This is a conspicuous and easy to monitor species.

Sedge Wren (*Cistothorus platensis*)—Sedge Wrens are a small secretive bird that can be found in sedge wetlands and wet grasslands. This species has been declining in recent years for reasons that are poorly understood. It is an uncommon breeder in the Lake Michigan watershed of Illinois. Although breeding pairs do not have high site fidelity, it may be a good indicator of the overall health of local and regional wetland complexes.

Black-crowned Night-heron (*Nycticorax nycticorax*)—Colonies of Black-crowned Night Herons have been found along the Illinois lakefront, including Spring Bluff Nature Preserve, Midwest Generation, and in at least five locations in the Lake Calumet wetlands from 1984 through 2009. Poor hydrological function and damaged culverts resulting in disruption of natural cycles critical for hemi-marsh habitat as well as the invasion of Common Reed

(*Phragmites australis*) in the wetlands appear to be related to the loss of this rookery. Although there is a suspicion that this colony relocated to Lincoln Park, there is strong local interest in creating and maintaining conditions that will encourage reestablishment of the Lake Calumet colony.

Insects

Hoary Elfin (*Callophrys polios*) – This small hairstreak butterfly is often found along the edge between woodlands and sand prairies. Larvae feed on bearberry, *Arctostaphylos uva-ursi*, or sometimes on *Egigaea repens*. Found in open sunny glades in barrens, rocky ridges, dunes, forest edges, adjacent to bogs. Extreme NE Illinois is at the periphery of its range. There is a known population at Illinois Beach State Park.